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OHIO

WATERSHEDS

OPERATION & MAINTENANCE

HANDBOOK



SOIL CONSERVATION SERVICE

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OPERATION AND MAINTENANCE HANDBOOK
FOR PROJECTS INSTALLED WITH ASSISTANCE
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STATE OF OHIO
WATERSHEDS
OPERATION AND MAINTENANCE HANDBOOK

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I. General

This handbook is intended to acquaint sponsors with the essentials of operating and maintaining their watershed projects. The information and suggestions will help each sponsor understand and appreciate the job more fully so that it can be carried out in a timely and efficient manner.

The life of a watershed project can be divided into three broad phases, i.e., planning, installation, and operation and maintenance. Real effort and quality workmanship are essential in all three phases if the project is to provide the watershed community with the desired benefits. Sponsors may request and get considerable professional assistance for planning and installing their projects. In fact, trained Soil Conservation Service (SCS) technicians actually perform many of the various and complicated tasks in the first two phases. The operation and maintenance phase is equally critical and requires effort and expenditures throughout the useful life of the project. Sponsors are required to operate and maintain projects without financial assistance from SCS.

II. Definitions

A. Operation

The administration, management, and performance of nonmaintenance actions needed to keep completed works of improvement functioning as planned.

B. Maintenance

Work required to keep works of improvement in, or restore them to, their original physical and functional condition.

Maintenance includes performance of work and application of measures to prevent deterioration as well as restoring, rebuilding, replacing, and putting together parts that have been torn, broken, or deteriorated.

C. Operation and Maintenance Agreement

A binding agreement between watershed sponsors and SCS that records the action each is to take in the operation and maintenance of the works of improvement described in the agreement.

The operation and maintenance agreement is a record of mutually satisfactory arrangements for:

1. Periodic and special inspections to determine how works of improvement are functioning and what operation and maintenance are needed.
2. Report of findings and record of how, when, and by whom the needed work is to be done.
3. Record and report of the cost and the date work was done.

A plan of operation and maintenance detailing the major routine needs is included in the operation and maintenance agreement. A separate plan is included for each measure or group of measures for which the routine operation and maintenance needs are expected to be different.

III. Reasons for Operation and Maintenance

Watershed projects move into the construction stage only after it is determined that the resulting benefits will equal or exceed the cost. The categories of cost include administration, land rights, installation, operation and maintenance. Thus, watershed structures are designed and installed with the knowledge that operation and maintenance will be required.

The cost of operation and maintenance can be expected to increase if action is delayed. For example, delaying action to control woody plant growth in some channels for a single year can more than double the cost of spraying or cutting the plants. In addition, woody plants restrict waterflow and prevent the channel from effectively performing its planned project function. It is usually a small job to repair erosion rills when they first develop on earthen fills or in spillways. If erosion is allowed to continue, the corrective measures become more costly; in extreme cases, inattention to these maintenance needs can cause the structure to fail.

IV. Beginning of the Operation and Maintenance Phase

Each portion of watershed works of improvement enters the operation and maintenance phase when it is completed.



1. Good vegetation adds up to low maintenance.



2. Remove woody vegetation from drainage ditches for proper maintenance.

Structures installed by contract are considered completed when they are accepted from the contractors. Structures installed by local organization force accounts are considered completed when SCS agrees and notifies the local organization that the installation has been completed in accordance with the approved plans.

Vegetative measures are considered completed as soon as either of the following conditions are met:

- A. SCS determines that an adequate cover has been obtained.
- B. Two growing seasons have elapsed after the initial vegetative installation.

The earthen embankment, spillway, and other structural portions of a dam may enter the operation and maintenance phase before planned vegetative cover is obtained on the earthen portions. Sponsors are responsible for maintaining the structural portions as soon as the work is accepted from the construction contractors. However, sponsors are not expected to bear the entire cost of repairing damages caused by lack of planned vegetative cover if damages occur before vegetative measures are completed.

SCS will notify sponsors when, in accordance with these criteria, the vegetative measures are complete.

V. Responsibilities for Operation and Maintenance

A. Contractor

The contractor is responsible for providing an installation that fully conforms to the contract drawings and specifications. Usually the contractor's responsibility for the work has been completed and accepted by the contracting officer. But under certain circumstances the contractor's liability may be extended. For example, the factory warranty on items, such as electric motors, may extend for a specified number of months or years. If this is so or if a failure results from the use of material or workmanship of less quality than specified in the contract, the contractor's responsibility may extend beyond the date on which work has been accepted by the contracting officer.



3. Good vegetation sod prevents gullies.



4. A well planned operation and maintenance program of mowing, litter control, and reseeding results in good camping and clear water.

B. Sponsoring Local Organization

The sponsors are fully responsible for financing and performing operation and maintenance needs on works of improvement without SCS cost-sharing assistance. If there is a malfunction or failure of any works of improvement, the sponsors should notify SCS immediately. The sponsors should avoid any action that would relieve the contractors or contractor suppliers of liability.

C. Soil Conservation Service

SCS is to determine the cause and measures needed to correct any malfunction or failure of watershed works of improvement. If design or construction for which SCS was responsible is at fault, SCS will provide funds if available for the federal share of reconstruction costs. A separate agreement detailing work to be done and cost-sharing arrangements must be signed by SCS and the sponsors before the work is started.

SCS will:

1. Plan and design structural measures to function satisfactorily with reasonable maintenance for their estimated life.
2. Provide sponsors with complete, frank, and timely information on the expected cost of operation and maintenance in time, effort, and money.
3. Include in the work plan a complete description and discussion of anticipated major, as well as uncommon, items of operation and maintenance needs for each type of structure.
4. Counsel with sponsors on entrance and user fees where applicable.
5. Help sponsors make maintenance inspections for the first 3 years.
6. Furnish information from as-built plans when needed.

Within the limits of available resources, SCS will also:

7. Help sponsors schedule and program their operation and maintenance resources.
8. Advise sponsors on operation and maintenance controls and techniques.
9. Make engineering surveys and designs for maintenance when needed.

VI. Performing Operation and Maintenance

One of the first and major problems that sponsors need to resolve is arranging for funds to pay for operation and maintenance work. Experience has shown that fees collected for concessions and use of public recreation developments seldom cover the total cost of operating the development and leave no funds for maintenance. Plans for individual landowners to maintain structures on their own land are usually unsatisfactory because of changing interests, ownerships, and costs. Expected freewill donations to cover maintenance costs usually fail to materialize when needed.

Tax assessments provide an equitable and continuing means of funding operation and maintenance activities.

Although the watershed work plan includes an estimate of funds for the designed life of the project, actual costs can be expected to vary from year to year. For example, weather conditions could require higher-than-normal expenditure for operation and maintenance the very year a structure is completed.

Thus, sponsors will need enough funds to begin maintenance as soon as work is completed; and arrangements should be made to accumulate a reserve of funds to pay for greater-than normal annual maintenance costs as they occur.

The manner of getting maintenance performed should be carefully considered and a method selected that will best fit the resources, desires, and capabilities of the sponsors. If sponsors have the equipment and work forces and are normally engaged in similar work, they may wish to use their own forces. Some sponsors have been very successful in arranging for local or state public works or highway departments to do the work. In all cases, it is strongly recommended that



5. Good vegetation stabilizes channel slopes. The area below the fabridam is eroding because of turbulence created by the dam. Prompt maintenance will protect the channel slopes and the structure.



6. Equipment that is maintained in a timely manner will prolong its life and give extended periods of trouble free operation.

sponsors appoint maintenance managers and delegate authority to arrange for force-account work or to contract for the work. The important thing is to get timely performance of quality maintenance work.

VII. Plan of Operation and Maintenance

Operation and maintenance needs for dams, channels, or other works of improvement depend on variable factors such as topography, geology, size, purpose served, and use. Some items of maintenance may be critically important for one or more structures but may be less important for other similar structures in the project. Identifying operation and maintenance needs, structure by structure, will be useful to sponsors in planning and scheduling an effective operation and maintenance program.

SCS will help sponsors of each project prepare a plan of operation and maintenance tailored to fit each of the planned works of improvement having different operation and maintenance needs. The plan of operation and maintenance should be as detailed as necessary to identify all items of maintenance that are likely to be needed and specify the means to be used to accomplish them. It should be prepared before installation of the works of improvement is started.

Some examples of operation and maintenance actions that may be required on watershed works of improvement are listed in the appendix. Sponsors may find this list helpful in developing individual plans of operation.

VIII. Operation and Maintenance Inspection and Followup

The timing for some recurring operation and maintenance needs can usually be predicted with reasonable accuracy. For example, the operation and maintenance of public recreation facilities may require continuous attention during certain seasons. The vegetation on some earthen embankments may be expected to need an annual application of fertilizer and perhaps mowing periodically during certain seasons. The plan of operation and maintenance includes provisions to take care of these types of recurring needs. However, other operation and maintenance needs can be determined only by careful onsite observation. Thus, it will be necessary for sponsors to arrange for periodic inspection of project structures.



7. A structure is designed to stop and collect certain types of trash.



8. A maintenance program is needed to clean and remove the trash from the structure. Trouble free operations depend on an applied maintenance program.

SCS will help sponsors inspect each structural measure to determine operation and maintenance needs for a period of 3 years after the structure is completed. Inasmuch as untreated minor maintenance needs can grow rapidly into major and costly maintenance problems, it is highly recommended that inspections be made 1 month after the structure is completed, every 3 months thereafter for 1 year, and annually thereafter. In addition, each structure should be inspected after unusually heavy runoff-producing storms. The findings, showing the needs and the date maintenance is to be performed, are to be recorded and made available to SCS. SCS also requests that sponsors send a copy of their accomplishment records that show the date of completed work and the cost to sponsors. This information will help SCS keep maintenance cost estimates current, thereby enabling SCS to provide better help to other sponsors. Many sponsors have found that simple forms help in recording and reporting inspection and follow-up activities. SCS will help sponsors develop forms that meet the needs of both the sponsors and SCS and insure that local and state requirements are observed.

IX. Environment

Watershed projects are designed to improve the total environment of the community. Actions are taken during project installations to minimize adverse effects on the environment. Completed projects should be living evidence of the consideration and concern sponsors have for the future well-being of the entire watershed community.

How successful this effort will be depends directly on the manner in which the project is operated and maintained. Methods and procedures of operation and maintenance activities can be developed that maintain and add to the beauty of the area, eliminate health hazards, control erosion and other pollutants, avoid contamination from use of unproven pesticides and herbicides, improve the economy and insure the safe use and enjoyment of all facilities for their planned life.



9. Structural measures can be maintained to serve both man and the wildlife of the area.



10. A structural program that is maintained in a ready position will always function as planned.

APPENDIX

A. Operation

1. Operate gates and other features to regulate the retention or release of water for irrigation, drainage, flood control, or other use in accordance with the watershed work plan. Operation must comply with permits granted under state or local laws as they apply to the storage, release, depletion, and use of water.
2. Regulate storage and volumes in multiple-purpose reservoirs, if so designed, to provide for maximum flood storage if watershed and snow pack conditions dictate.
3. Maintain elevation of the water surface in erosion control structures insofar as natural conditions permit to prevent headcuts and erosion in the upstream channel.
4. Develop, promulgate, and enforce reasonable and necessary regulations for occupancy and use of each public recreation and fish and wildlife development in order to protect the public's health, welfare, safety, and enjoyment. These include regulations for use of recreation areas and facilities within design limits and for purposes intended. Misuse, including overuse, of an area leads to rapid deterioration, diminished esthetic value, and general depreciation of the environment, usually accompanied by unsafe and unsanitary conditions.
5. Confine travel by motor vehicles to designated roads and parking areas to prevent erosion, damage to vegetation, impairment of recreation values, and adverse effect on fish and wildlife resources.
6. Keep the speed of traffic within acceptable and safe limits.
7. Keep each recreation facility clean and sanitary.
8. Sweep, mop, wash, disinfect, decontaminate, deodorize, or service in other ways toilets and restrooms as often and intensively as necessary to maintain acceptable standards of cleanliness.

Service septic tanks as needed to keep them functioning properly, to reduce objectionable odors, and to exclude insects and rodents.

9. Prevent, insofar as practicable, contamination or pollution of all water for human consumption and/or recreation use. Test water regularly and treat all water as necessary to protect public health. If the water is unsafe, immediately post against using it. Take all reasonable steps to prevent use of unsafe water until corrective measures are taken. Consider applicable state and local laws, ordinances, and codes as minimum requirements for safeguarding public health and safety.
10. Dispose of garbage and other refuse as often as necessary to avoid threat to public health and safety and detraction from public use and enjoyment. Keep containers tightly covered. Do not allow containers to overflow and treat them to minimize obnoxious odors. Empty containers often enough to prevent breeding of flies and other disease-bearing insects and rodents.
11. Eliminate from recreation areas all safety hazards such as dangerous trees, toxic plants, broken steps, protruding nails or bolts, glass, and cans.
12. Provide lifeguards at swimming areas as required by state and local laws and regulations.

B. Maintenance

1. Vegetation

- a. Reseed, resod, and fertilize areas of poor stand or areas destroyed by erosion. If necessary, restore eroded areas before reseeding.
- b. Cut or spray with approved herbicide and remove undesirable vegetation. Observe local ordinances regarding spraying and burning.
- c. Fertilize vegetation as required to maintain a vigorous stand.
- d. Control grazing to insure proper vegetative cover.
- e. Mow grass at regular intervals to maintain optimum cover.

2. Channels--lined and unlined

- a. Remove silt bars and properly dispose of them outside the channel perimeter.
- b. Remove and properly dispose of debris. Give special attention to removal and proper disposal of debris and repair of erosion damage at structures.
- c. Replace, reinforce, or extend riprap where needed.
- d. Keep access roads for maintenance and maintenance travel-ways in usable condition.
- e. Maintain dikes and spoil to divert water to protected inlets and prevent overbank flow.
- f. Fill contraction cracks in lined channels with appropriate material.
- g. Renovate channel banks damaged by storm flow.
- h. Rehabilitate damaged pipe inlets from fields or side channels. Replace eroded soil adjacent to structures.

3. Earth dams

- a. Replace soil removed by rodents.
- b. Inspect drainage systems and relief wells annually for proper functioning and clean out or replace as necessary.
- c. Maintain riprap or other wave-protection measures and replace as needed.
- d. Remove and/or stabilize slide material as soon as practical. It may be necessary to construct a berm or flatten the slope.
- e. Restore to proper elevation dikes that have settled.
- f. Replace eroded material and revegetate eroded areas in emergency spillways.

4. Structures

- a. Stabilize the plunge pool with appropriate maintenance measures at the outlet of principal spillways having propped outlets.
- b. Keep stilling basin free of debris-rock.
- c. Restore eroded earth materials or damaged riprap around energy dissipaters and reseed the area if appropriate.
- d. Restore concrete that has deteriorated.
- e. Maintain in proper working order gates and valves, trash racks, and metal works. Immediately remove ice and debris that may hamper their function. Restore protective coatings if necessary.
- f. Maintain in proper working order pumping plants including housing, trash racks, gates, electrical or mechanical controls and equipment, and power units.
- g. Maintain fences in good condition until there is mutual agreement that they are no longer needed to protect structural works of improvement.
- h. Maintain in proper working order fish and wildlife features such as fish ladders, traps, screens, water level control gates, etc.
- i. Repaint, as needed, all surfaces requiring protection by paint.
- j. Maintain in good condition and proper working order recreation facilities such as bathhouses, toilets, docks, beaches, etc.
- k. Remove weak diving boards, hidden rocks, or other obstructions in swimming waters. At all swimming areas:
 - (1) Conspicuously post general safety rules.
 - (2) Establish depth markers.

- (3) Provide, if practical, lifesaving and first-aid equipment.
- 1. Repair and repaint or replace signs and plaques to keep them sightly and functional.

